Early L1B Earth Scene IR Validation

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Objective:

Perform early sanity check of L1B radiance with minimal assumptions about instrument/software data quality

At first light the calibration software is validated

- **Scan angle dependent view factors**
- **Spectral uncertainties**

- **Poor knowledge cloud distribution (especially night)**
- **Daytime solar scattering for short wave channels**

How can we minimize calibration uncertainties related to these issues?

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❖**Technique:**

Use surface marine observations to validate AIRS in window channels, especially the super "transparent" 2616 cm-1 (4 μm) channels. 2616 cm-1 limited to night time.

Acquire near synoptic NOAA surface marine observations and SST climatology in “reasonably clear” regions, identified using GOES IR imagery

Apply coarse corrections to L1B radiances for atmospheric transmission and surface emissivity

Compare TOA L1B adjusted with sea surface temperature (SST) 'truth' data (e.g. Reynold’s product)

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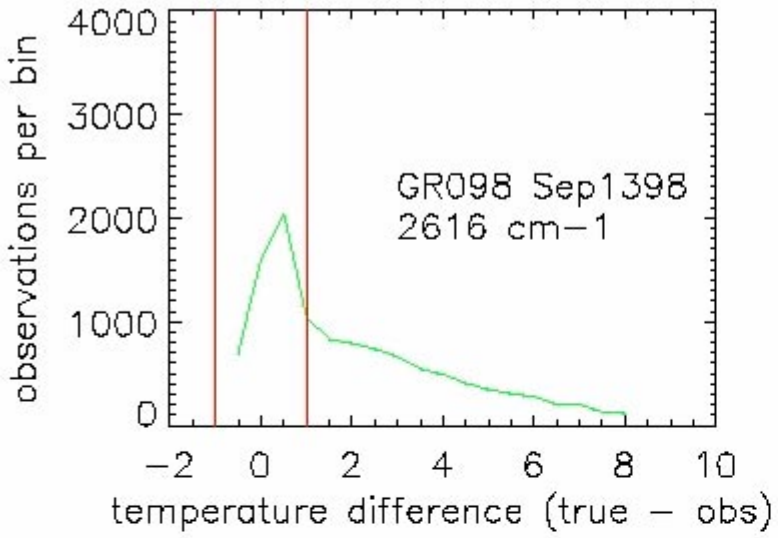
Results using data from the Simulation Exercises:

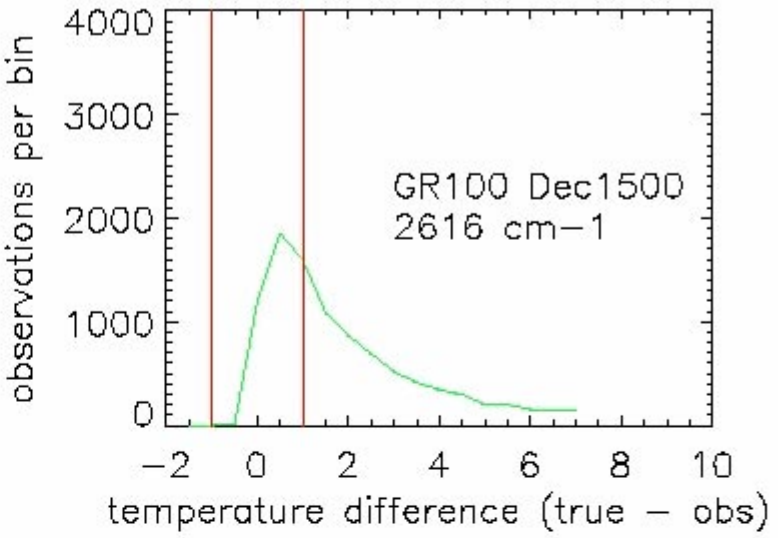
Acquired archived surface marine data in tropical/semi-tropical regions (granules) in Pacific Ocean for AIRS simulation days 09-13-98 and 12-15-00

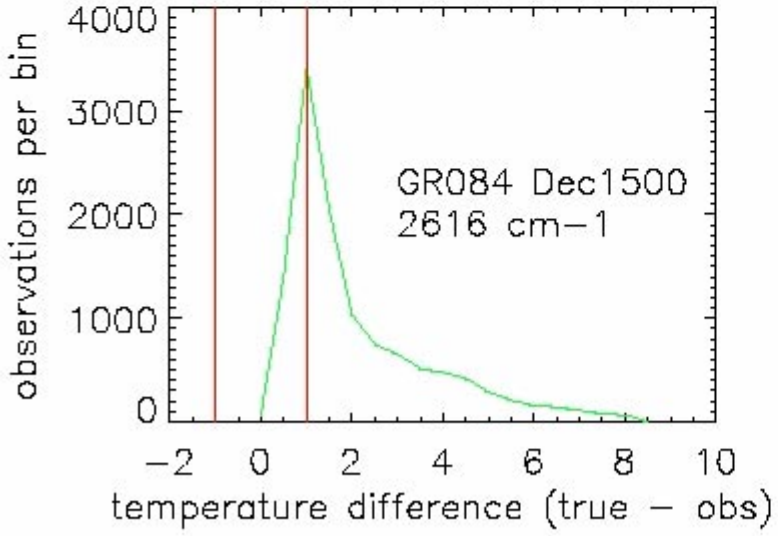
Using Strow spectra from standard tropical profiles, applied transmission and surface emission corrections to TOA BT

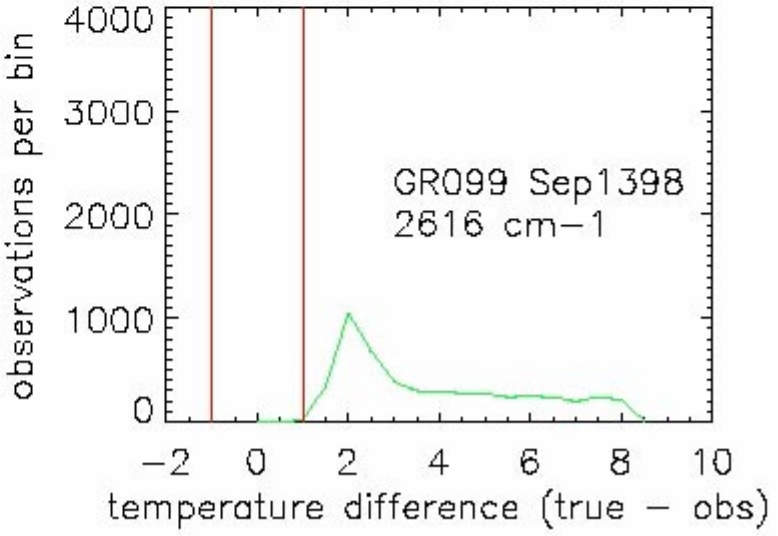
Statistically compared SST 'truth' with TOA BT (adjusted to surface) at 2616, 2520,1232,1096, 961, 893, 832, 824 cm^{1} (detector modules M1a, M2a, M4d, M3, M7, M8, and M9). Only the 2616cm-1 data have an almost climatology independent TOA correction

The histogram of BT(true-obs_TOA) in 0.5K bins from each granule (12150 footprints) at 2616 cm-1 night time granules show distinct modes in short wave regions. The histogram plot is cut off at 8K.









D.Hagan (JPL) Thu Feb 15

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From the Figure we see that

1. **The histogram show pronounced peak (mode) on most granules.**
   Use GOES IR images to identify "reasonably" clear granules.
   10-20% of the points are within 0.5K of the mode.
   The cold tail of the histogram is due to cloud contaminated FOV.

2. **The method "works" for three of the four tested cases.**
   When it is too cloudy (like lower right GR099 Sept 13 '98)
   the method does not work.

<u>Conclusion: Technique works for "sanity check"</u>
Given the uncertainty of the Reynolds SST a mode at +/- 1K is likely to be as close as this method gets. For the three cases where the method works, the mode is about +1K. A systematic cool bias is likely due to residual cloud contamination.